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ABSTRACT

This approach to the study of classroom teaching-learning processes concentrates on pupil time and the various ways in which it is used. The conceptual framework contrasts with most earlier studies that report teacher behavior as the most direct influence on pupil achievement. Two premises form the basis of the framework: (1) The total amount of time devoted to a particular instructional topic is the most important determinant of pupil achievement; and (2) There is enormous variation in learning time for different pupils. The foci of the conceptual model are pupil pursuits and activities, teacher activities being relevant only in the way they influence those of the pupil. The leading organizational concept is an "a priori" concept of time in the Kantian sense. A pupil spends a certain amount of time in school as defined by educational policy. The time factor preconditions educational effects by defining the quantity of schooling. Amounts of schooling have strong, causally interpretable relations to achievement. Pupil activities and time allocations are additionally influenced by outside administrative and organizational superstructures. Teacher planning and classroom carry through, teacher evaluation procedures, and policy research emerge as unexamined but vital foci for further research. (MM)

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Teaching-Learning Processes in Elementary School: A Synoptic View*

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Introduction

Roused by depressing reports on the ineffectiveness of schooling and being puzzled as well as tantalized by the offspring of comparative cross-national studies on the impacts of education, we decided to venture forth on this poorly charted continent of which we had heard so many stories. We did not expect to leisurely walk through smooth terrain , but anticipated difficult headway from earlier reports.

We surmounted the foothills of the first chain of mountains, reached a little plateau and now pause, still near the point where we started our laborious but fascinating adventure; looking back, we write our report.

At the beginning of our trail was the survey on Equality of Educational Opportunity (Coleman, et al., 1966), a valuable data source that entices to re- and further analyses, of which we only mention the two most prominent: On Equality of Educational Opportunity (Mosteller & Moynihan, 1972) and Inequality (Jencks, et al., 1972). All three of these remarkable studies conclude that schools as compared to homes have only scanty effects on pupil acquisition. It was only logical for politicians to infer that expenditure for education is a luxury, an area to cut first when the economic situation deteriorates, as at present. Budgets have been cut back and the resources that remain are additionally constrained by rising energy costs so that districts have shortened school years, increased class sizes, and reduced teaching staffs, all horrifying developments.

Our debarkation onto the continent of research on schooling was propelled by our disbelieve of these study outcomes. We soon found that neither considerate questions were asked nor were conceptualization and data-analytic models thoughtfully approached. The major issues of how much and what kinds of schooling pupils receive and in what settings, were neglected. Short circuit relations between pupils' home backgrounds and achievements were drawn.

We started our journey with the conviction that the quantity of education is a fundamental and powerful determinant of pedagogical outcomes. We did not arrive at this conviction empirically -- although we had educed evidence which strongly supported our view. We felt that it is abundantly obvious that -- when circumstances such as aptitudes and supporting conditions do not vary -- the more time an individual spends trying to learn, the more he will learn. Most research effort in education has been devoted to the study of variations in those aptitudes and supporting conditions. Such efforts are doomed to failure -- educationally -- so long as the social conditions of educational life permit or encourage large differences in the amounts of time devoted to learning.

As we proceeded, we stumbled over another eudcational reality: Pupils are not directed to the same goals and they do not attempt to learn equivalent content. For two classes at the same level in different districts or states, even the intended curricula may be so discrepant as to be non-overlapping. These inconsistencies have considerable implications for the assessment of

learning outcomes and their causes. Any achievement test represents a selection of content from one or more curricula. Whether the selection process is systematic, random, or even implicit is unimportant. The significant point is that curricula -- implemented or not -- will vary in the degree to which they are embodied in the content of any test. Therefore, variations in assessed achievement are caused by mismatches between test and taught content as well as differences in the amounts learnt.

A third feature of classroom realities intruded upon our musings once we began to examine learning processes in detail: the cyclic or periodic character of classroom activities. A small number of distinct forms, such as seat-work or reading group, recur with great regularity; they are the tiles which a teacher arranges into her instructional mosaic. These forms may be newly tinted or subtly reshaped for a particular day's teaching, but the basic types are the touch-stones of the teaching-learning process. These teaching-learning modules hold the key to both content and timing of learning.

Once we had grasped these essentials -- classroom activities, their content and timing -- we saw our goal. A model for teaching-learning activities fashioned so as to mediate between the social conditions of learning, on the one side, and the psychological conditions, on the other. I.e., a system which would designate the consequences of educational policies and teacher reflections, i.e., characterize teacher actions, and simultaneously the sources of pupil learnings and acquisitions, i.e., represent pupil action and experience.

The wellspring of our current as well as our earlier efforts is the Carroll (1963) model of school learning. It caused us to probe into the distinction between learning time and learning rate as they define acquisition. Another turning point in our work was the separation of the variety of causes of learning into functional groups, forced upon us by a thorough consideration of Bloom's (1973) work.

1. Harvesting the Weeds

Political decisions ground on values, but they are likewise too often based on mere belief about causalities of societal relations rather than on sound knowledge. The reason for this is usually not the unwillingness of politicians to search for evidence concerning the pros and cons of the issue to be decided upon, but the lack of available evidence which could rationalize their decision making process. Committees of expert advisors exemplify this situation all too often.

Requests for advice on how education should be organized and on what should be taught, yield arguements which rapidly circle around those effects of schooling which are consequent of the teaching process. As the teacher has the title role in this process and as allocations of teacher as well as material resources play a major part in the political decision making process, we inevitably find teacher education and teacher performance central issues in the discussion of resource allocation in formal education.

What should teachers learn to be effective and efficient educators? Traditionally, the answers to this question have circled around either subject matters or teaching styles. But teaching involves not only the conveying of curricular content, it also involves actions and decisions which subdivide and allocate that content for and to pupils in differing types and amounts and in various fashions. Thus, the teacher is not only a resource to be allocated, i.e., hired and assigned by others to school and class-

room. This constitutes only a gross part of the allocation process. Within these assignment limits a teacher has, nowadays, ample latitude. While earlier in this century, U.S. school districts promulgated explicit policies concerning pupil exposure times in each subject area (see, e.g., Holmes, 1915), presently teachers have high flexibility in realizing curricular guidelines in the classroom. Consequently, the teacher controls and allocates her own time in the teaching process and directs pupils in ways which strongly influence and condition the kinds and degrees of their active learning.

By focussing on the teacher as the major part in the resource allocation process, we do not mean to undervalue the substantive issue of what should be taught or give fundamental priority to the formal teaching process over curricular goals, but merely aim to refine our understanding of the one cauterizing issue of implementation, the how of teaching.

The how of teaching is often falsely identified as mere teaching technology or style. Traditionally, American curriculum concerns have been focussed on educational goals defined in terms of knowledge and cognitive processes. We conceive of educative intents as relating to the interests, responsibilities, and social interchanges of pupils as well. Many aspects of teaching choices and activities which have been commonly categorized as matters of style or strategy have important educative consequences. Hence, there exists a fundamental substantive side to the how of teaching which can not be completely isolated from subject areas or curricular goals. For example, extreme individualization can not just be considered from the

perspective of learning efficiency in certain subject areas, it has likewise to be evaluated with respect to educational goals which involve cooperation, interaction, communication, etc. We restrict our present discussion to general curricular categories which relate to teacher planning in elementary school, but will come back to the substantive part when inferences for political decisions are to be drawn.

Our journey of conceptualization was cobbled with rough calculi some of which turned out to be stumbling-blocks when we investigated them closely. Only rarely did we find studies that grasped integrant parts of schooling (Gump, 1967, 1969, 1974; Smith & Geoffrey, 1968; Kounin, 1970) or attempted to link such issues directly to educational policy (Mann, 1928). Usually, investigators voluntarily don blinders which take root and grow into an integral part of their research personality. Consequently, research on the role of teachers in the teaching-learning process has yielded little usable evidence. Rarely have studies been integrative in concept or generalizable in measure and result. And they seldom can be used as sound ground for further theoretical work. Often, conclusions rest on faulty research designs, unclear concepts, and ignoration of earlier deficiencies and accomplishments.

Our rocky tramping through this literature was greatly quickened by several recent and clarifying reviews of research on teaching. We feel no desire to give still another summary of this research, as these thorough reviews, reflecting its status, are readily available (Rosenshine, 1971; Joyce & Weil,

1972; Travers, 1973; Duncan & Biddle, 1974). Instead, we consider it important to highlight several pivotal points which have been constitutive of misconceptualization in many studies and which have thus led to meager results, rarely suited for inferences useful to improve either teacher education or more directly the actual teaching and learning processes. Most of the shortcomings of the research can be sketched with the following five taps.

(1) Oversimplification of the Classroom Situation. The actual school situation is of extraordinarily high complexity. The approaches most often taken to handle such complexity in research studies have been either restriction to a simplified laboratory setting or focus on a few selected factors in the natural classroom situation. Both approaches have often resulted in fruitless oversimplifications. The factors selected for naturalistic investigation were often so few and so isolated from the reality of classroom teaching that neither useful scientific understanding of classroom settings nor generalizability of findings was possible. The laboratory studies have not been successful in investigating the consequences of key variables. They did not succeed in grasping the essentials of classroom pursuits and events, because only desultory naturalistic studies have enucleated such.

(2) Ignoration of the Trinity of Pupil, Teacher, and Curriculum. Research must simultaneously incorporate pupil activities, teacher activities, and the content of the teaching and learning situation, i.e., the curriculum. These three points de repère form and circumscribe the dynamics of class-

room events. It is not meaningful to disregard any of them. Most studies have attempted to link teacher characteristics and behaviors or the curriculum directly to pupil achievements. These studies have disregarded the most important mediating factor, the activities and pursuits of the pupils. All three, teacher activities, pupil pursuits, and the curriculum have to be considered before powerful statements can be made concerning the genesis of pupil achievement which will yield potentially productive changes in actual classroom settings.

(3) Isolation of Theoretical, Practical, and Empirical Work. Educational research still suffers from the gorgeous ravine that separates theoretical, practical, and empirical work and which tremendously inhibits progress. Useful theoretical conceptions have not been developed to the point of empirical verifiability. Many abstractions which carry the label theory are so general that there is no observable link to substantive data. Middle-level generalizations of those most familiar with teaching have been seldom utilized in research studies. Consequently, empirical research has been highly eclectic, poorly integrated, and rarely integrative. The result is that many research studies are off the promising track, i.e., have little importance to education. Non-theory-based empirical research can only by chance hit a pivotal issue.

(4) Methodological Malnutrition and Rigor Mortis. Educational researchers have been infected with the notion that the "experiment" is the "ideal" research design for the study of education regardless of the substantive phenomenon being investigated. This stance ignores the fact that experi-

ments are most knowledge-advancing after key concepts have been distilled from the natural situation. Surely, experimental data sets are most appropriately analyzed by first exploring the effects of those variables utilized in the experimental design. But this valuable emphasis on design-based data analysis as a total analytic strategy has inhibited the meaningful continuing exploration of the rich data deriving from experimental as well as observational studies in teaching. This tunnel vision of merely testing previously formulated hypotheses results in the impoverishment of both scientific understanding and public debate.

(5) Research in Cloudland. At present, there is no American tradition of policy-relevant thinking in educational research, although some studies have had explicit policy concerns (e.g., Terman, 1923; Counts, 1927; Conant, 1959; Coleman et al., 1966). Elementaristic and "basic" research have served technological functions, but have absconded from school policy. Often, the term basic research seems to mean research from which no policy inferences can be drawn. Actually, various kinds of research have differential importance for policy inferences, but if meaningful benefits are to eventuate, then policy concerns must enter the thinking of the research worker when the research problem is formulated, not just after the data have been collected and analyzed. Too often, research results leave us with a "so what?".

As a consequence of these problems, we still grope in the dark when asked about evidence of teacher effectiveness or the relation of educational praxis to outcome. The meager and crippled evidence, we have, is discontenting

for inferences implying allocation of societal resources to teacher education or schooling. We are in need of sound evidence concerning the causal factors of student performance.

2. The Model's Foundation and Scaffolding

We hope to emerge from the cloudland of policy irrelevance by developing a comprehensible model for classroom teaching-learning processes.

At this point, it seems necessary to clarify the often confusing conception of model. We follow Mill's (1962) distinction between theory and model:

> "A model is a more or less systematic inventory of the elements to which we must pay attention if we are to understand something. It is not true or false; it is useful and adequate to varying degrees. A theory, in contrast, is a statement which can be proved true or false, about the causal weight and the relations of the elements of the model."(P.36).

Our present elaboration emphasizes model development which flows from a rough theoretical frame to be laid out in the process of model unfolding. We advance the following criteria that specifications of theory and model must meet:

(1) Focus. A pupil's activities are central to his learning. The effects of all other aspects of the teaching-learning situation are mediated through the pupil's activities, e.g., those of the district curriculum and school organization, or the teacher's activities -- planned or unplanned. A fruitful theory for teaching and learning must place these activities as causally

intermediate between the teacher's implementation of the curriculum and pupil learning. Pupils' educational pursuits are focal to the analysis of teaching-learning processes.

(2) Coverage. In our model, we will differentially cover the various pupil activities and pursuits. These are strongly conditioned by the learning settings within which they occur. Important aspects of these settings include curricular content, teacher role, and pupil grouping or individualization. As pupil activities occur in time, our strategy is to segment the pupil's total educational day on that basis. The model structures pupil time according to these segments. A theory would specify the determination of pupil activities in these segments as well as the causes of their timing.

(3) Amalgamation. In order to be valuable for policy inferences, a model must amalgamate the various social dimensions influencing the teaching process. Classroom activities are influenced and conditioned by outside-organizational and administrative actions at the level of the school, the district, and beyond. These agencies control the hiring of teachers and their activities through district curriculum guidelines and administrative policies together with the material and intellectual resources they provide. Insights about the ways in which superstructures affect the classroom learning process are necessary if we are to effectively mould the educational process. In order to be fruitful for empirical investigation, we must further link these classroom pursuits to individual pupil learning.

(4) Unification. Models must be unified so that conceptual and operational definitions of variables are joint. A fusion of the theoretical and the empirical must take place.

We feel that if these criteria are met, the resulting model and consequent theoretical work will be productive of scientific understanding of classroom processes and of reasonable and reasoned educational policy.

In order to draw valid inferences about the consequences of characteristics of superstructures and activities on student performance, an enormous effort is necessary. Tracing effects of specific factors and separating them from those of others necessitates a comprehensive model and logically consequent operational efforts. Only recently, have we reached a stage of methodological and technical development that enables us to minutely follow one aspect of classroom activity while simultaneously accounting many others. The conceptual model which will serve as the substantive theoretical and methodological data-analytic basis will necessarily reflect the complexity of the teaching-learning situation and therefore involve multifold and complex dimensions relevant to the curriculum, to teacher behavior, and to student behavior and performance.

We will present our model by first sketching the grossest dimensions relevant to pupil achievement and proceed by unfolding these concepts. This process of exposition will be one of elaboration and likewise of constraint; elaboration with respect to subdivision and filigree-work of the relevant concepts, and constraint with respect to necessary constriction of some

areas in order to free focus on others. According to that principle, we will restrict the exposition of our model at marked points, to structure the view and likewise to emphasize the junctures for replication, generalization, and congregation. These points are:

(1) Curriculum Content. We will present the model for only one content area or defined curriculum unit, but we show the way that leads to expansion and assembly over several areas or units.

(2) Pupil. We present the complete model for an individual pupil, but will generalize to other pupils and summarize for classrooms.

(3) Teacher. The model exposition refers to only one teacher -- the typical elementary school situation -- but it is easily extendable to additional teachers.

(4) Classroom. We will spcify the model for one classroom, but indicate the path to aggregation over several.

Of course, our focus is on what pupils learn in school -- their achievement -- and on how they learn what they learn, i.e., the conditions of school learning. The assessment of pupil achievement has suffered from the lack of correspondence between what has been taught and what is assessed. In most school research implicit assumptions are made of curricular homogeneity. These unfounded postulates are hidden in the quantitative scoring of achievement tests and leave ambiguous the distinction between that which is not

learned because it is not taught and that which is not learned because it is taught or recepted poorly.

The how of teaching and learning is usually mutilated to rivet attention on teacher behavior, disregarding the pupils' activities and the collective action of teacher and pupil. We conceive that influences on pupil acquisition are soley via the pursuits of pupils. By the word pursuit we mean to emphasize that learning-relevant behaviors of teachers and pupils can be passive as well as active. We use the word pursuit and activity synonymously to imply this broad conception.

All influences on pupil achievement must be mediated through a pupil's active and passive pursuits. No one can gain knowledge or take up new ways of thinking, believing, acting, or feeling except through seeing, looking, and watching, hearing and listening, feeling and touching. These control what and how one learns. Less proximal influences, be they as general as the district curriculum and policy and the school organization or as specific as a teacher's education, personality, planning, and activities, only control and condition these pursuits. This focal causal linkage constitutes a central uniqueness of this model. In contrast, most earlier studies have conceived of teacher behaviors as directly and mystically influencing pupil achievement.

The coarse bird's eye view of our model (Figure 1) has only six major components which are subordinated to three categories: background factors, in-

cluding the curriculum, institutional features, and personal characteristics of teachers and pupils; teaching-learning activities; and pupil acquisitions. Figure 1 shows that pupil achievement constitutes the only type of acquisition we are currently considering.

Insert Figure 1 about here

The foci of the model are the pupil's educational activities and their relations to those of the teacher, i.e., the teaching-learning process. This unique aspect of the model will be most fully elaborated below. The molecular unit, implied by our viewpoint, is a single pupil pursuit followed within the context of a specific curricular content, a singular pupil grouping, and a characteristic role of teacher supervision, i.e., within a learning setting. We emphasize that the whole model is fundamentally focussing on pupil pursuits and activities, teacher activities being only relevant in the way they influence those of the pupils and through them pupil acquisition.

The leading organizational concept which is basic in the unfolding of this model is the a priori -- in the Kantian sense -- concept of time. A pupil spends a certain amount of time in school. Crudely, we talk about years of obligatory schooling, length of school year and day, pupil attendance. These gross quantities have a great policy importance, as they are closely tied to expenditures in education and exemption of age groups from economic productivity.

The time concept not only determines the societal costs of education, but also preconditions educational effects by circumscribing and defining the quantity of schooling, particular pupils receive. These amounts of schooling, however unrefined as indicants of the varigated educational process, do have strong, causally interpretable relations to achievement (Wiley, 1973). And these relations have potent implications, even in this gross form (Wiley & Harnischfeger, 1974).

Historically, these concepts have played important policy roles. State legislatures regulate by law the lengths of school day and year, and the attendance of pupils. States have also laid down guidelines for the use of teacher and pupil time within these legislative limits and earlier in this century, U.S. school districts had explicit policies establishing the amounts of exposure time required in various curricular areas -- down to the minute!

A survey of 444 school districts in the twenties (Mann, 1928) painted a picture roughly similar to the contemporary one (Wiley, 1973). There was and is a tremendous variation in the pupil's school-day length, but state legislatures have succeeded in systematically homogenizing the length of the school year. This effort toward "equal opportunity" is but one step -- an important one, however -- in educational policy. Curricular determinations kept teachers, in the twenties, in tighter rein than nowadays. Time allotments to content areas and the instruction therein were closely stipulated to the teacher. Heavy emphasis was given to language and reading instruction (Table 1), an area still constituting the center of gravity for present elementary school curricula.

Insert Table 1 about here

Our approach -- concentrating on pupil time and the various uses which are made of it -- derives from two strong convictions:

(1) The total amount of active learning time on a particular instructional topic is the most important determinant of pupil achievement on that topic.

(2) There is enormous variation in time for learning for different pupils, their time devoted to specific learning topics, and their total amount of active learning time.

The extent of acquired knowledge has been commonly conceived, by educators as well as psychologists, to be determined by the amount of learning time and the efficiency with which that time is used, i.e., learning rate. Research on learning has traditionally concentrated on the determinants of learning rate. The investigation of learning time was neglected, the usual fate of the obvious. In our model, learning time and learning rate play crucial roles.

Our other conviction (2) is based on data analyses we performed (Wiley, 1973) and in which we have found large variations among schools in the amount of schooling time. Backing for this judgment is not limited to recent investigations; e.g., Mann (1928; p.141) found that: "One of the most striking facts revealed by the analysis of present practice in time allot-

ments in 444 cities is the extreme variation in the total amount of time given to any subject...." We traced some of the implications of such variations through their impacts on achievement (Wiley & Harnischfeger, 1974). The evidence supports the conclusion that the variation in learning time for individual pupils must be even larger than that among schools, implying that the total policy import of these variables may be greater than that revealed in our earlier work.

A pupil's time spent in school on specific content, in a defined learning setting, i.e., an activity or pursuit, is our more refined educational unit. The concept of time enables us to specify classroom pursuits for the teacher as well as for the pupils, in a common coin. To smooth the way through the model unfolding, we will first mark the trail by blazing crucial concepts, i.e., we will display the major turning points at which the pupil's pursuits are further sifted and sorted to match his achievements (Figure 2). The trip along the trail, aligning and relating pupil pursuits and teacher acitivities, as well as detailing these, will be undertaken in the next section.

Insert Figure 2 about here

The model portrays the pupil-activities core as the utilization of pupil time, both in and outside the classroom. We call the total school time Quantity of Schooling. This time is defined by the district through lengths of school year and day. Unforeseen cuts from this amount, be they caused by

weather, the declining conditions of school buildings, parent boycotts, or teacher strikes, result in a discrepancy between the nominal quantity of schooling and the actual amount. This latter time will be reduced for a particular pupil by his absences. We call the resulting amount of time, which forms the basis for the teacher's time allocations to a specific pupil, the Quantity of Schooling (Pupil K).

A pupil's quantity of schooling is allocated to various curricular areas and consequently to diverse pupil pursuits. Placing a particular subject matter or curricular area (X) in relief, we term this allocation the Total Time Spent in X-Pursuits (Pupil K). This X-pursuit time is the key to what and how much of X pupil K learns.

But, of course, no pupil uses this total allocated time for active learning. When a teacher assigns a task to a pupil, e.g., a quarter hour of unsupervised seat-work in mathematics or twenty minutes of reading in a subgroup, this does not necessarily imply that the pupil will be involved in active learning for all of that quarter hour or twenty minutes. Multifold impediments may intervene. The pupil might

-- be disrupted by other pupils or external events such as accidents or fire alarms,

-- be allowed or forced to interrupt his involvement due to the lack of attention or distraction on the part of the teacher,

-- be uninterested in the task.

All this implies that he will typically be working for less time on his task than the total he was assigned. The above examples suggest that the specific portion of a pupil's allocated time during which he is actively

working, may be limited by the behaviors of the teacher and other pupils, by out-of-class events, and by the pupil himself.

The Total Active Learning Time on X (Pupil K) is determined by a pupil's task involvement, which is influenced by his intrinsic motivation, by the teacher's motivating skills, and by her surveillance. Ultimately, it is the pupil's own learning management skills which determine the limits of active learning time.

We conceive that only this active portion of the time assigned to a task is effective for learning X. That is, the lower the frequency and duration of learning hindrances, the higher the active-learning-time percentage, and the larger the resulting total amount of active learning time, compelling greater educational outcomes.

We have now broken down quantity of schooling to the active learning time. But although the pupil is actively attempting to learn, he might not acquire new knowledge, insights, and skills rapidly. The pupil might

- -- be of low aptitude,
- -- not have received clear enough instructions to understand the task,
- -- be faced with a task too difficult for his level of preparation,
- -- be presented content more slowly than he is able to learn.

All this implies that even though a pupil is actively learning for a specific time, the effective, i.e., achievement-relevant time might be less, because the general comprehensability of the instruction was low or because

his preparation or aptitude was insufficient. Only that portion of time during which a pupil is actively learning and comprehending a task assignment is effective for his acquisition, i.e., only the Total X-Content Comprehended (Pupil K) has the direct link to Achievement on X (Pupil K).

The content comprehended by a pupil is influenced by two sources: (1) the pupil's aptitudes and his prior achievements, and (2) the teacher's presentation skills and behaviors and the character of instructional materials. Only if a teacher can organize and structure a task, give clear instructions, and appropriately choose pace and complexity level, will a pupil be able to successfully use his learning time.

We have now blazed the trail from Quantity of Schooling to Achievement, marking the concepts of Pursuit Time in a curricular area, Active Learning Time and Comprehended Content, along the way. These pivots, represented in Figure 2, form the skeleton of our model.

3. Model Elaboration

We will now proceed our model elaboration by scrutinizing more narrowly parts of the teaching-learning process. Our filigree-work will evolve from focussing sharply on the two fundamental pivots of teacher and pupil activities.

Although the star in our show is the pupil, we will first probe outside the limelight, in the wings. We immediately spot the stage manager, the teacher. As he is the key person for all ongoing activities, we will take a close glimpse at his planning and actions.

3.1 At Sea in the Classroom: Some Open Issues

A teacher's day has many facets and potentials. The chance of moulding a new generation and the considerable freedom allowed in the attempt are fascinating challenges of the profession. But, of course, a challenge can be nothing but a burden, if teachers are insufficiently equipped for their tasks, if curricular materials and school facilities are pauperized, and if parental support is non-existent. Any of these may cause even an engaged and dedicated teacher to surrender, although not necessarily her job.

Teacher education is but one educative means, although one with the greatest of latent power, to steadily advance toward a more humane society. The crux is that it takes greater continual investment than freshly wrought materials or newly constructed facilities and -- a more crucial point -- it involves a considerable lag, because teacher education and consequent implementation of acquired skills demand time.

What worsens the situation is the fact that social and educational inquiry have provided only limited knowledge that is useful in teacher education. Psychology has some concepts and findings to aid pupil motivation and inter-

action among teacher, pupil, and parents; psychological assessment and educational test development furnish support in diagnosing pupils' cognitive and affective problems as well as enabling appraisal of pupil achievement. Similarly, the tremendous expansion of curricular development has greatly increased the variety of curricula among which the teacher might choose, although without correspondent and supportive teacher education this market looks unstructured and confusing.

When we try, however, to prepare a future teacher for directing a classroom, we become weak-voiced -- leaving beginning teachers completely at sea -- when faced with many issues which are of basic curricular and managerial importance. For example, what are criteria for group formation that result in effective learning? Under which conditions should a teacher form small groups or completely individualize instruction? For what and whom is total class instruction most effective? How should a teacher split her time among and between groups and individual pupils? How can a teacher most effectively keep surveillance of the whole class while working with one group? How should a teacher handle the transitions between activities so as to minimize their durations?

Our answers to these questions must be vague as we have little secure knowledge. We do assert, however, that alongside curricular content, teaching strategies have significant effects on pupil acquisition. To illustrate this, we will later give a hypothetical example of grouping strategies and their achievement consequences for three classrooms.

3.2 Teacher Planning and Preparation

In actual teaching, whatever the status of the teacher's knowledge on instructional issues, she does select certain curricular content, she does make decisions about groupings, and she does allocate specific time periods to certain activities. These form an integral part of teacher planning and preparation.

A major part of the teacher's job is to turn a set of curricular goals and related content into a working plan. Aspects of planning include textbook and material selection, processes for initial subgroup formation, longterm strategies for content coverage over the school year, learning assessments of individual pupils, subgroup reassignments, setting learning goals for specific pupils, scheduling of lessons, and detailed planning for instruction on particular days.

Teachers plan or prepare -- to differing extents -- their inclass time in advance. These preparations may be formal -- explicit lesson plans for the next day's, week's, or even later teaching -- or so informal that the teacher is only conscious of them when they are implemented.Much of informal planning is the product of past years of preparation by experienced teachers. This planning -- implicit or explicit -- usually includes rough time allocations to subject matter areas and decisions about grouping strategies to be used within them.

These teacher planning decisions, whether curricular -- in the narrow sense -- or strategic, are constrained by sundry limitations. They depend not only on the teacher's skills and preferences, but also on her perception of pupils' needs, on district curricular guidelines and administrative policies. Also, school facilities, supplies, and material resources such as available equipment or type of classroom; intellectual and personnel resources such as reading specialists and curriculum libraries; and organizational arrangements such as team teaching enter into the planning decisions. Furthermore, there are time constraints such as legislatively or administratively mandated durations for school days, lunch periods, and recesses as well as those times which are needed for transitions from one educational activity to another.

The non-uniformity of these diverse demands, supports, and restraints results in a vast divergence of teacher planning and preparation. All of these fundaments, be they sustaining in one district or limiting in another, are directly relevant to educational policy either through the selection of teacher skills, in the most general sense, for shaping and schooling, or through districts' decisions about and allocations to e.g., curricular centers, school facilities, teacher aids.

Definitely, a skillful teacher is one that carefully -- not necessarily explicitly -- plans her school day. Teachers have perceptions of the individual needs of pupils in different subject areas. These perceptions are based on pupils' prior achievements and aptitudes, and they vary among curricular areas. Accordingly, a teacher allocates school time to subject areas, plans

specific activities for subgroups or individuals and allots her time differentially to groups and individuals. Only under exceptional circumstances will a teacher ordain identical curricula or use equal amounts of her time for each pupil. Usually, individual pupils will get differing kinds and amounts of teacher time depending on the curriculum and the teacher's grouping and individualization strategy. Of course, on the side of the pupil, his attendance will also influence the amount of time he spends in activities and pursuits related to a particular curricular area.

Resulting variations in teacher planning correspond to large differences in actual teaching strategies. Gump (1967, 1969) has traced some of the commonalities and variations in the use of various educational "environments" for several elementary school classes. Later (1974), in studying differences between architecturally "open" and more traditional classrooms, he found sizable discrepancies in the employment of different grouping settings. Following the same line of thought, Grannis (1971) uncovered extreme variations in the utilization of grouping and teacher supervisory surrounds among various preschool curricula. In a more recent investigation, Bossert (1975) studied six primary school classes over an extended period and in great detail, identifying two consistently different teaching styles which conformed to distinct time allocations among grouping settings. If we exploit his results to contrast individualized and grouped settings of all types, he found that teachers of one style consistently employed individualized contexts considerably more often (74%) than group settings (26%) while those of the other style had opposing priorities (43% vs. 57%).

Activity preparation and lesson planning are educationally vigorous seedlings. But, by no means, do we assume that their fruits ever fully ripen. Many factors may intervene in the process of their actualization. Unforeseen disturbances such as fire alarms, earthquakes, boycotts, strikes, and accidents might cause discrepancies between planned and actual activities. Also, teachers might misperceive the pupils' prior understandings, especially when handling a new class and might therefore need more or less time than initially allocated to a specific topic. Finally, a teacher might misjudge the necessary time for teaching a planned unit even though she accurately assessed the pupils' prior knowledge. This latter problem might occur more frequently with inexperienced teachers.

But although departures from planned activities, i.e., from projected time allocations, grouping arrangements, and content to be covered are expected to some extent, planned and actual activities are usually not very discrepant. And this is an educationally important claim. We consider teacher planning and the investigation of departures from planned classroom activities, be they voluntary or forced by events beyond the teacher's control, of vital importance in education, because we do endorse the stance that education is an intentional process (Cremin, 1970). As a consequence, we view curricula, time allocations, and teaching strategies (e.g., grouping arrangements) as means used to attain specified goals.

If educators are hindered in the actualization of their plans, then a central pivot which defines education is amputated. Basic decisions on the total quantity of schooling offered, on curriculum content, and on time

allocations among particular subject matter areas would never reach realization and therefore miscarry. Our resources would be misspent.

The policy importance of these decisions can not be overstressed. The revision of curriculum priorities, as they control time allocations, constitutes the most powerful known mechanism for influencing pupil learning. The linkage of curriculum policy to teacher planning to actual classroom activities forms a chain which terminates in pupil acquisition, the educational outcome. An accounting of variations among actual allocations in different classrooms should inform us about the general roles of curricular policy, teacher preferences and skills, and pupil characteristics in this chain and should specifically help us utilize teacher education in strengthening or weakening the various links.

3.3 Learning Settings and Classroom Activities

In unfolding our model further, we first dissect or section the teacher's inclass time into subject areas. Of course, not all of a teacher's time can be neatly pigeonholed in particular curricular areas. Some is devoted to activities which are mainly managerial and which have no discernable -- direct or indirect -- educative intent. Examples include the time required to redirect pupils from one subject area to another, or to send them out of the classroom at the end of the day or at recess or lunch time. These periods we will account below.

Within each subject area, however, a teacher engages in certain activities which might involve the whole class, subgroups, individual pupils, or she might merely keep vigil while the pupils engage in unsupervised pursuits. At this point, we recall our model's molecular unit which is a learning activity or pursuit defined by a certain subject matter, a specified grouping situation, and teacher supervision or non-supervision, i.e., a setting. The first, we have left unspecified, as the variety of curricular labels may vary from teacher to teacher, school to school, or time to time. For the second, we have designated three possibilities: whole class, subgroup, and individual pupil. The third, we postpone until a discussion of the pupil's school day, merely indicating here that we concern ourselves only with the gross dichotomy: teacher presence and absence.

Why do we take these three characteristics as defining? Surely, there are many educationally relevant characteristics of learning settings. In Gump's (1967, 1969, 1974) evolving conception of a nearly matching concept, he has appended the action-quality of the activity, the source of its pacing and the type of pupil interrelationships that accompany it, to his definition. We feel that the primary characterization of settings should not be so complex, because the actuality is, in fact, simpler. When teachers plan, they plan about reading groups, language seat-work, helping individuals with their mathematics problems, whole class instruction in science, ... These settings are conceived and implemented as organic unities, not as collections of characteristics. We also think that when the teacher organizes these unities, she is primarily concerned with the goals and content of

instruction (curricular area), to whom the instruction is given (grouping and individualization), and whether or not she is present (teacher supervision). Other characteristics are secondary not primary.

Admittedly, there may be subsettings within these primary setting. E. g., the reading group may pass from drill to recitation. However, it is the reading group which has a primary and independent existence as a focus for planning and actual instruction. And it is the reading group which is defined by the characteristics of curricular area, grouping, and teacher supervision. Later, as empirical evidence, practical experience, and conceptualization grow, we will have to find an explicit role for the subsetting. For now, we content ourselves with the primary notion of learning setting.

We now detail these settings from the prospect of the teacher. First, we narrow or focus to that part of a teacher's school day spent with pupils inclass, i.e., inschool preparation, recess, and lunch times are excluded. After rationing the teacher's inclass time into amounts alloted to particular subject matter areas, we now magnify the teacher activities within one area in a fashion that likewise applies to others. The design or working plan which the teacher uses to apportion her inclass time among these types of activities, constitutes her grouping and individualization strategy.

We unfold the teacher's total inclass time for a specified subject matter into four setting categories which form the basis for a complete parti-

tioning of the instructional time a teacher spends in the classroom:

(1) Whole Class Activities

(2) Subgroup Activities

(3) Teacher-Supervised Individual Pursuits

(4) Teacher Managerial Activities

The first three account that portion of a teacher's inclass time devoted to goal-specific instruction in the particular curricular area. The last category includes teacher inclass planning in so far as it is related to the specific subject area. But it also encompasses that time which is needed to reassign pupils from one activity to another, e.g., from whole class instruction to subgroup instruction, from supervised to non-supervised group instruction, or from individualized instruction, supervised or not, to another setting, all in the specified subject area. These times are likewise part of teacher management.

While recess and lunch times may be equal for classes, grades, schools, or even for all pupils in a state, the amount of time that pupils spend moving from one task to another -- accompanying changes in subject matter and group setting -- are highly dependent on the individual teacher and her class. Some teachers use very little time for "reshuffling" pupils between task assignments. Surely, managerial skills of teachers play an important role in such transition times, but characteristics of her class members such as their number and their behavior also matter. On the whole, however, total pupil learning time should be significantly influenced by a teacher's classroom management skills.

Our detailing of these teaching-learning activities does not flow from knowledge about the differential effects of activities on achievement, but follows the conventional practice of curricular subdivision and the traditional teacher custom of grouping and subgrouping. That is, it is directly aligned with the ways teachers structure and plan their classroom activities.

Subsequently, we hope not only to shed light on the different influences which specific groupings have, but likewise on the effects of the dynamics of these grouping and individualization strategies. The question is not whether individualization is more effectful than group work; the question is which mixtures of grouping and individualization are workable for what kinds of pupils, teachers, and subject matters.

The other reason that encouraged us to use typical teacher grouping strategies as a category system for teacher planning and its realizations concerns the implications that these grouping and individualization strategies might have for resource allocation. If certain strategy patterns are more successful for certain teachers, certain topics, and certain pupils or classrooms, then grouping strategies must play a central role in teacher education.

8.4 Teacher Capabilities

Thus far, the importance of teacher planning for pupil learning was exposed and some of the dynamics of teaching plans for pupil achievement were demonstrated. In short, we have characterized the content of planning, not its process.

Little is known about planning processes. These actions encompass skillful behaviors involving specifications of alternative activities and choices among these alternatives. The characteristic processes are unstudied, especially as they involve the preparation and programming of larger units of time: days, weeks, and months. The domain of relevant competencies and capabilities is uncharted.

Implementation implies conformity between plan and actuality. Planned activities have devised components, configurations, contents, and durations. However, occasionally, these prepared activities do not occur at all, sometimes components are missing, often they are rearranged. Also, scheduled contents are postponed or never reached, planned pursuits may begin early or late, last longer than scheduled, or be curtailed. These inconformities between planning and actuality at times result from events which are unpredictable and unmanageable, but they also derive from artless management and unrealistic planning. Some teachers under- or over-estimate pupils' capacities and receptivities for particular contents; some manage their activities awkwardly, excessively syphoning valuable instructional time for managerially necessary, but learning-meager pursuits.

While grouping and individualization strategies and teacher's planning and managerial skills do impose restrictions on the pupils' learning attempts, these competencies do not exhaust the limitations confining a pupil's active learning time. Another area of essential teaching skills is that of inducing, including motivating and monitoring. A teacher's enthusiasm and talents for manifest surveillance influence pupil motivation and task involvement. Teachers differ in the proficiency with which they design, pace, and sequence, as well as motivate and monitor the activities and pursuits of pupils within learning settings. These capabilities together with pupils' intrinsic and task-specific motivations, minutely control and limit the opportunities as well as the desires fo task engagement and consequently determine the time devoted to active learning.

And there is still another highly important area of teacher skills: The teacher's capacity for fashioning her intended communications to the pupil intelligibly, so that he can fathom them and thus use his active learning time most efficiently. To do this, a teacher has to acquire certain verbal facilities and organizational skills, but also interpersonal sensitivities that enable her to clearly formulate, structure, and express the content and issues and to appropriately pace the tasks for specific pupils.

This sketchy glimpse at particular teacher skills serves only to concretize hypothetical causal influences on pupils' learning activities. Each successive impediment to active task involvement, whether consequent to a lack of teacher skill or not, removes a part of the time available for effective learning. These hindrances, e.g., pupil inattention or teacher distraction,

cause different types of losses of effective time and, in turn, have distinct origins. Each succeeding obstacle further limits the core of time for active learning. Only this resulting core is relevant for educational outcomes.

We conceive the decompositions which produce this more minute and delicate winnowing very differently from the broad curricular and grouping time allocations central to our earlier discussion. The allocations were discerned as relatively direct consequences of teacher planning. The sorting and sifting of activity time under current consideration must be viewed dissimilarly, however.

With the increasing refinement of our awareness of teaching-learning processes, the controlling events become more numerous, more minute, and less predictable. It is therefore difficult to regard these momentary occurances as "planned". They are better understood as short-lived, immediate decisions or reactions. Nevertheless, these time losses may cumulate to a significant amount and thus can considerably curtail actual teaching and learning. These losses, as well as the planning issues emphasized earlier, can be addressed during the teacher education process and consequently, we may be able to effect greater effective quantities of schooling.

In their peripheries, the skill areas are not easy to separate. At the boundary, planning is difficult to distinguish from implementation. Some decisions may not be made until the last minute, later plans are modified, re-

vised, or even newly formed because of the problems or successes of previous implementations. Also, certain basic habits and characteristics such as orderliness may affect both the adequacy of planning and the success of implementation.

Similarly, implementation, as it becomes more microscopic, may be difficult to separate from the inducing of active learning in individuals. The less macroscopic the view of teacher activities and behaviors, the more reasonable is the presumption of momentary reaction and response as opposed to planning and reflection. Since the distinction between implementation (of plans) and inducing (of behaviors) derives from this opposition, the natural shading of one into the other makes the line difficult to draw. As such, some skills will generalize across any border we care to mark.

Finally, once we restrict ourselves to the domain of the short-lived and immediate, some teacher behavior patterns will have multiple consequences. Specific characteristics of communications may, e.g., have motivating effects, causing pupils to spend more time actively attempting to understand, while they also increase the rate at which pupils absorb the prescribed content.

For all this shading at the boundaries, however, the central roles of these groupings are distinct; they impinge at different points in our model of teaching-learning and consequently have distinct functional effects on the ultimate pupil acquisitions. Carefully crafted teaching plans facilitate intended pupil acquisitions within broad ranges of implementations as they

allow the selected curricula, and no others, to be taught. Consequent sound implementation facilitates pupil achievement. Motivating and monitoring powers conduce greater learning, because pupils work harder and spend more time trying to learn. Well-structured and clear communications raise learning rates when pupils are watching and listening.

3.5 Grouping and Individualization Strategies and Their Effects on Achievement: A Hypothetical Example

The function of this extremely simplified and completely hypothetical example is to demonstrate the consequences for achievement for seemingly minor differences in teaching strategies which themselves -- as shown above -- are only a small part in the total teaching-learning process. The simplicity of the example lies in the fact that the instructional settings solely vary with respect to the teachers' grouping and individualization strategies.

Let us assume equivalence of the three settings in the following aspects:

- -- There are three classrooms of the same grade with equal numbers of pupils.
- -- The classrooms do not differ with respect to the pupils' characteristics, i.e., abilities, prior achievement, SES, etc..
- -- When grouping, the teachers divide the classes according to prior achievement into three equal-sized groups: the upper, the middle, and the lower thirds.
- -- The three teachers have equal skills.
- -- They teach the same curriculum, here: integer addition.
- -- They each have three hours available for the teaching of integer addition.

So, the only aspect in which the three instructional settings differ, is the grouping strategy the teachers use. The teachers are free to choose among the following instructional groupings:

-- total class,

-- subgroups,

-- individual non-supervised seat-work in integer addition,

-- individual non-supervised seat-work in something other than integer addition.

Teacher Buehler

She decides to use half of her time (1½ hours) for total class instruction and the remaining time for one-half hour of subgroup instruction for each of the three achievement groups (Table 2). She allocates the non-supervised pupil time differentially to the subgroups: The high achievers are allowed to engage in seat-work in something other than integer addition; the middle group is supposed to spend the one-half hour of seat-work on integer addition and the remaining half hour on something else; the low achievers must spend the whole seat-work time on integer addition.

Insert Table 2 about here

Teacher Ewald

She does not believe that total class instruction is effective and therefore devotes her three lessons to subgroup instruction (Table 3). The high achievers receive one-half hour of group instruction and are then sent to their seats for one hour of work in integer addition and one and one-half hours of other seat-work. The middle group is given one hour of group instruction. They then are asked to work for one and one-half hours on integer addition in seat-work and they have one-half hour for other work. The teacher devotes most of her teaching time (1½ hours) to the low achievers and they are assigned one and one-half hours of seat-work in integer addition. So, the low achievers have no time left for other activities.

Insert Table 3 about here

Teacher Oates

Like Teacher Buehler, she devotes half of her instructional time (1½ hours) to total class teaching (Table 4). The other half of her time, she divides between her middle group (½ hour) and the low achievers (1 hour). The high achievers are given one-half hour of seat-work on integer addition, besides the total class instruction, and then left free for other seat-work. The middle and low groups work all three hours on integer addition, the middle group being assigned one hour of seat-work and the low achievers the remaining half hour.

Insert Table 4 about here

In order to now convert the time allocations into achievement scores, we assume, as indicated above, that the teachers are equally effective with pupils of high, middle, or low ability in each instructional setting. However, we do not assume that each setting is equally effective for the three types of pupils. Table 5 specifies the effectiveness of each type of instruction for each kind of pupil. The numbers in the table indicate the number of units of achievement resulting from one hour of instruction in each setting for each type of pupil. We should point out that our assumed achievement gains for the specific settings are entirely fabricated.

Insert Table 5 about here

High achievers are specified to benefit most from subgroup (2 units) and individual seat-work (2 units). It is assumed that total class instruction is generally oriented to pupils of lower ability and thus is not as effective (1 unit) as the other settings. Middle-level achievers are specified to benefit most from subgroup instruction (1½ units), while total class (1 unit) and seat-work (1 unit) are assumed less effective. The low group benefits most from subgroup (1 unit) and seat-work (1 unit) and less from total class instruction (½ unit), as do the high achievers. In general, we have specified subgroup instruction as most effective, individual non-supervised seat-work as intermediate, and total class instruction as least effec-

tive. We have also specified that absolute instructional effectiveness increases with the ability of the pupil. These assumptions are entirely arbitrary. We made them only to illustrate the potential effects of grouping strategy on achievement. Once these differences in effectiveness have been empirically assessed, we will have a powerful tool for increasing teaching effectiveness.

Looking at the resulting average achievement gains of the three classes (Table 6), we find that the teacher who does not believe in total class teaching (Teacher Ewald) but instead devotes her teaching time to subgroup teaching, increasing the teaching time with decreasing prior achievement-level and acting according to that principle also with respect to individual seat-work, reaches the highest average gain in her class. Every achievement group in her class gains by the same amount. -- The teacher with the second largest average gain (Teacher Oates) gives as much total class instruction as the least effective teacher (Teacher Buehler), but is more differentiating with respect to subgroup and seat-work instruction. -- The teacher who pays the least attention to differential time allocations concerning her achievement groups, is the least effective.

Insert Table 6 about here

This example highlights the significance of a teacher's grouping and individualization strategies. Purposefully, we assumed that the classes did not differ in pupil background, teacher skill, or formal curriculum. Though the

teachers' grouping and individualization strategies form the sole variation, we detected remarkable differences in average achievement gains after only three hours of instruction. This indicates that the effects of grouping and individualization strategies may have strong policy implications. But we would like to remind the reader of the hypothetical nature of these data and assumptions, as we lack knowledge about the efficacies that particular instructional groupings have for the achievement of various kinds of pupils.

What is frightening about this example is the fact, that even if we manage to give an equal amount of schooling to pupils -- which we are far from -- we might expect tremendous differences in pupil acquisition depending on teacher instructional skills, her curricula, her grouping and individualization strategies, materials and facilities, and last not least pupil background. To understand the consequences of a teacher's curricular decisions for pupil achievement, we must now pan over to an individual pupil and investigate what kinds of activities, he might be faced with.

3.6 A Pupil's School Day

It is obvious that teacher grouping and individualization strategies play a signal but not exhaustive role in the determination of the learning activities of particular pupils. These strategies determine most of the settings in which a pupil learns and determine the framework for time alloca-

tions to these settings. Within these allocations, a teacher is free to handle particular pupils. Most of this freedom and flexibility is lodged in the subgroup assignment of the pupil and in the character and extensiveness of the seat-work which he is given. Although the pupil himself controls the advantage he will take of a specific task assignment, the teacher specifies and arranges these activities, especially in elementary school.

School days are circumscribed and formed by limiting and supporting preconditions: Administrative regulations control maximal instructional times; curricular priorities limit and focus planning decisions; pupils or teachers may be absent. Within these constraints, however, a teacher subdivides her total working time by curricular area and thus plans and implements corresponding allocations of available pupil time (Figure 3).

Insert Figure 3 about here

The subject matter priorities (X, Y, Z, etc.), on the one side, and the grouping and individualization strategies, as implemented for particular pupils, on the other, are the major determinants of the teacher's and pupil's school day. Their unfolding embroiders the link between the quantity of schooling for a particular pupil (K) and the total school time he spends on a specific curricular topic (X). Grouping settings and subject matter priorities are essentials in accounting for quantity of schooling, i.e., the pupil's total school time.

A constraint of the exposition of the model to a certain subject area (X) frees our eye to focus on specific dynamics of teaching-learning processes. Our model reduction implies that we investigate the causes of pupil achievement in one particular area at time. The model does not attempt a taxonomy of curriculum-related activities, tasks, topics, or subject matters, and our elaboration merely sorts classroom activities into two curriculum-relevant categories: those related to a defined curriculum topic or subject matter, to be detailed and studied, and those related to other areas and topics. Thus far, our model does not contain criteria for stipulating a felicitous extensiveness for the particular topic chosen for investigation.

This decomposition may be questioned if it is taken literally as defining exclusive and exhaustive curriculum categories. We do not deny possible influences of other subject matter areas on the achievement under study. For example, instruction labeled "language" is manifestly productive of "reading" achievement. We merely assume that when specific goals or acquisitions are assessed, activities germane to them are jointly accounted and that the neglect of others will simplify the model without degrading its utility for research and policy. Only after some basic understanding of the teaching-learning processes has been acquired, will such model refinement be fruitful.

As we now focus on a specific pupil (K), we may decompose the total time a pupil spends on a subject matter (X) into seven categories (Figure 4):

(1) Whole Class Pursuits

(2) Teacher-Supervised Subgroup Pursuits

(3) Teacher-Supervised Individual Pursuits

(4) Unsupervised Subgroup Pursuits

(5) Unsupervised Individual Pursuits

(6) Transitions

(7) Out-of-School Pursuits

These learning settings are defined by grouping and supervision within a specific subject area. They are distinct from those used to categorize teacher activities in that pupil pursuits can be unsupervised as well as supervised (Figure 4).

Insert Figure 4 about here

The first three parts correspond to the teacher categories. Except for absences, whole class time is identical for the teacher and pupils, as all pupils are exposed to whole class instruction. However, the subgroup time is distinct for the teacher and for specific pupils, because the teacher does not spend all of her subgroup time with the group of which pupil K is a member. This difference also holds for the teacher-supervised individual time. A particular pupil receives only a small portion of teacher tutoring. Pupils spend their remaining inclass time in non-supervised individual (seat)-work, group work, and in transitions between pursuits. Finally, school-based learning does not only occur in the classroom. A major portion of the learning activity of a pupil takes place outside the school,

but is conceived, planned, and assigned by the teacher. As such, homework is clearly an important vehicle for school learning.

The inschool settings for individual pupils together with the curricular areas allow us to subdivide the total inschool time for a particular pupil, i.e., his school day, into the time he spends, e.g., in mathematics seatwork, in a reading subgroup, or in total class instruction in biology. The total time ledger on school-related work for the teacher and the pupils has also to account the teacher's out-of-class and the pupil's out-of-school working times. But for now, we only tally inschool time, and our current model specification solely analyzes one curricular area (Column X in Figure 5).

Insert Figure 5 about here

We are now in the position to describe the segments which are instrumental in the differentiation, detailing, and totaling of a pupil's quantity of schooling. As we said above, the total amount of a pupil's schooling apposite to a subject area depends on the quantity offered -- lengths of school day and year -- on his absences, on the subject matter priorities, and on the teacher's allocations of instructional time to that pupil (K) as an individual. Furthermore, we have learnt that the part of a pupil's total quantity of schooling which is directly relevant to curriculum goals, is also determined by the extent of such non-curriculum-related activities as recess, lunch, and inclass transitions.

The molecular unit of an individual's quantity of schooling is a specific learning pursuit of that pupil (K), i.e., a specific assignment to a learning setting. This learning pursuit is delimited by the learning setting which it concretizes, i.e., by curricular areas, grouping, and teacher supervision. When any of these change, that is, when the setting is switched, a particular pursuit ends. Transition periods initiate and terminate particular pursuits. Thus, the total reading-group time a pupil spends is the sum of all the reading-group pursuit-times accumulated through the day, week, or year.

To summarize a teacher's curricular priorities and teaching strategies as they are implemented for a class and its pupils, we refer to Figure 6. This display facilitates the accounting of pupil inclass time in terms of the curriculum, the grouping strategy, and the kind of teacher supervision, i.e., the learning setting. The diagram has arbitrarily nominated three subject areas to exemplify the variety of possibilities. It has delimited a particular learning setting within an area by marking whether the setting consists of the total class, a subgroup, or a single individual; each of these alternatives either teacher directed or not. The five prevailing combinations -- unsupervised total class settings have been excluded from explicit discussion because of their presumed rarity in elementary school -- together with transition categories within and between subject areas, permit the accounting of the totality of inclass time for a single pupil. Tallies will vary within a class because of differences among pupils in group membership, absence, as well as choice and interactions with the teacher on an individual basis.

Insert Figure 6 about here

These reckonings may be summarized and aggregated in a number of profitable fashions. Sums by curricular area, grouping category, or teacher supervision describe aspects of the learning opportunity structure for an individual pupil. Aggregations of the complete accounting or its summations over pupils characterize the curricular precedences and instructional schemas of a teacher as they are carried out. Further cumulations for types of pupils or classrooms with specific attributes would bear upon curricular decisions or assessments of equality of educational opportunity.

To concretize these implemented priorities and strategies and their consequences for the parcelling and disbursement of the pupil's quantity of schooling, we adapted a display that Gump (1967; Appendix B) constructed (Figure 7). It sequentially depicts a whole school day for a third grade class in terms of subject areas; whole class, subgroup, and individualized work; transitions; and milk, recess, and lunch times. We consigned our focal pupil (K) to the first Reading Group and the Small Arithmetic Group and then tallied the amounts of schooling he received during that day in specific subject areas and groupings (Table 7).

Insert Figure 7 and Table 7 about here

The actual school day started four minutes late at 9:04 a.m. and ended at 3:45 p.m., i.e., its length was six hours and forty-one minutes. If we deduct lunch and recess time (1½ hours) we find that the pupils spend 5¼ hours in class. But not all of that time is usable for teaching and learning. Milk time and opening exercises occupy eleven minutes, so that only a little more than five hours remain. All of these constraints hold for every pupil in the classroom. Only within them, pupils' instructional times vary depending on their group assignment and consequent transition periods.

For Pupil K, we calculate that he spent about one-half hour in transitions between activities or pursuits, leaving four and one-half hours for actual learning settings. Looking at the curricular areas, we note that the emphasis is obviously on reading and language, amounting to 37 percent of Pupil K's time while he spent only ten percent of his instructional time on arithmetic.

However, we are not entirely confident of the completeness and representativeness of these time allocations among subject areas, because we have accounted only a single day and because we lack information on the curricular pertinence of the seat-work settings, which account for fully one third of our pupil's activities. This handicap serves to underline the importance of an exhaustive accounting of all pupil activities and pursuits, not only with respect to grouping but also curricular area and supervision, another factor about which we lack explicit information for our example.

Our exemplified teacher spent all of her time, allocated for arithmetic, in subgroup instruction, which was also true for reading, while for language, art, and music, she decided to spend the entire time with the class as a whole. Again, we should keep in mind that we do not know the contents of her seat-work assignments. On the whole, she spent about 58 percent of her instructional time in subgroup instruction, of which Pupil K received less than half. As every pupil is included in whole class instruction, if not absent, Pupil K and his teacher spent identical quantities of time (40%).

As Gump's concern was the educational environment and not educational attainment, we are not in the position to trace Gump's example through to achievement, as our model dictates. Also, since he was not attending to the origins and intents of environments, we cannot link the example back to teacher planning or curricular policy. Though the example exposes only one spot in our model, yet it objectifies an essential, instructional settings, and enlightens the prominent concepts.

4. Some Directional Markers to Policy-Relevant School Research

Owing to the outlaying of our conceptual model, we can now point to those politically relevant educational issues already addressed and nominate those further questions which, we believe, the framework can speak to.

The primary educational system is set up as means to mediate those skills, knowledges, etc. to the growing generation that are either insufficiently transmitted in the family or are more economically taught in a formal group setting such as a classroom. In this century, the public or its governing apparatus has increasingly taken over responsibilities for raising future generations. This trend holds for Eastern as well as Western countries, although to differing degrees. Nowadays, parents as leaders of individual families have lost much educational influence on their offspring, if we compare them to those in earlier centuries. But the degree of loss does not hold equally for all social classes and the evaluation of this movement toward more pervasive public education becomes more difficult, the more we differentiate our focus to the lower social classes, on the one side, and to those who hold the political power, on the other.

In the U.S., as the overwhelming majority of youngsters finish fully twelve years of schooling, it is not nearly so important to discuss the economic issue of children as family breadwinners, as in developing nations. What is more hard pressing presently, is the issue of what schools should teach. This issue becomes more viable, the more education is transplanted into public responsibility. How can we select and agree upon the skills and knowledge to be transmitted? Which of these should be basic commonalities and in which do we prefer disparity? How much freedom of choice should be given to minorities or individual parents? Another vital issue, the social impediments to participation in the educational decision-making process, is usually "resolved" in the way that citizens with little formal education rarely actively participate in debate over educational issues.

The question of who decides on what should be taught is presently unsolved. Conflicts between legislative bodies, school boards, and educators are increasingly common. There are no reflected mechanisms for this decision-making process. Should politicians as our representatives decide upon educational goals?How much influence should educators as experts have in that process? What should be the smallest decision-making unit? The school district? Although these questions of what should be taught and who should decide are issues of paramount importance, and could be addressed with the model by means of a more precise assessment of what is taught, we are not directly addressing them here.

A logically following issue is that of how to build curricula, once a decision on goals has been reached. Although this task, on the surface, seems to be a technical one reserved for educators, it is fundamentally political. Specified goals never fully reflect the values held by those who specify them. Consequently, fully realized curricula implement goals which have remained implicit and carry the potential for disagreement and controversy. Thus, in many cases, specific contents, originally only curricular vehicles, or the methods and strategies of teaching have important educational consequences for pupils. Again, we do not specifically address this issue here, although our model is relevant. Instead, our study starts with curricula as givens.

The assumption of a prescribed curriculum implies that, at least in rough terms, decisions have been made about goals and about which content is to

be taught, when (meaning at what age), to whom. What remains is how this is to be accomplished. We emphasize again that the teaching variations, traditionally categorized in the how niche, have curricular relevance as well. What we wish to stress, however, is that decisions and actions about how occur within a framework of curricular guidelines, children's ages, and backgrounds.

The how, as we have emphasized above, is focussed on the pupil. This how of teaching becomes the what of pupil activities and pursuits, and the how question becomes: What pursuits should pupils follow to learn this curricular content or achieve these goals? I.e., what should the core of the teaching-learning process be?

As we conceive it, the realities of teaching and learning and the ways in which we structure and understand them are the keys to fundamental policy issues in education. Above, we strongly emphasized the focal role of the pupil and his pursuits as the commonly missing link in a chain, mediating all influences on pupil acquisitions. We also stressed the teacher as a second vital link. She is the major instrumentality for curriculum implementation. Fully eighty-five percent of the costs of schooling are bound up in the teacher's personage. She is the controlling person in the design and execution of planned pupil pursuits.

Chained together, teacher activities and pupil pursuits constitute the teaching-learning process. Learning settings and the educational activities

of pupils and teachers delimit and define it. Our model, including specifications for and timing of the various learning settings and the pursuits within them allows a precise description of process variations. Thus, we can compare teaching-learning processes among curricular areas, pupils, teachers, classes, time periods, or their aggregates.

The consequences of such a description are direct. Curriculum and program evaluation have suffered from the lack of refined tools for characterizing the implementation of the programs and materials to be appraised. Once detailed time allotments are available, distinctions in achievement consequences of curricular innovations can be more clearly assigned. Some will be attributed to departures from intended curricular emphases, teachers curtailing or omitting some required program units and extending the coverage of others. Other achievement variations will be ascribed to similar discrepancies from non-mandated rather than required program characteristics. These sources of achievement dissimilarity can then be distinguished from more important ones such as variations in the learning efficacy of particular content segments. Curriculum decisions, whether they concern Congressional appropriations or textbook choices by individual teachers, would be improved by such information.

Another issue of high salience is equality of educational opportunity for pupils of disparate backgrounds. We are fully cognizant of the controversy pitting equality of result against equality of treatment. Whatever the political criterion, however, the teaching-learning process -- as it is realized for an individual -- and its accounting and control are central issues. Our

conception of this process, at its foundation, differentiates among individual pupils: Each pupil has his own planned and implemented curriculum. The description of that individualized curriculum allows subtle relations to be drawn from pupils' social and educational backgrounds to the opportunities which they are given and to the relations between those opportunities and educational outcomes. The interpretation of such relations is not simple; complex processes surround pupil opportunity. Nevertheless, detailed information about differences in pupils' exposures to educational experiences would greatly inform the political debate on inequality.

Perfected assessments of the implementations of curricular programs or the educational experiences of individual pupils are not the only fruits of our model and our perspective. The focus on pupil pursuits leads to basic questions concerning teachers: Which teacher activities and behaviors lead to these pursuits? How can we educate teachers for these endeavours and how can we select those teachers who can bring them to success? These questions bring the issues of teacher education and teacher selection into full focus. Thus, ultimately, a central issue becomes: What are the implications of teacher activities and behaviors for teacher selection, the teacher education curricula, and their evaluation?

The major assumption of empirical research in education is that we may meaningfully explore policy alternatives by assessing the consequences of variations in educational practice. In this case, that assumption concretizes itself in the investigation of variations in teachers' activities.

We assume that exploration of the consequences of such variations will inform policy about what teachers ought to do.

This assumption is not the only one we must make, however. We also postulate direct and non-problematic links between prescribed or chosen activities together with teacher actualizing competencies, on the one side, and implemented or accomplished activities, on the other. That is, we assume that: (1) If a policy is formulated and accepted concerning the goals and conforming contents of pupils' learnings, (2) if it is agreed what pursuits a pupil must follow to learn that content or goal, (3) if it is also decided which teacher activities lead to these pursuits, and (4) if the teacher is able to successfully accomplish those activities, then (5) the teacher will carry out these activities. As long as prescription or prior choice (1, 2, and 3) and competency in implementation and action (4) determine real performance (5), we are free to concentrate our attention on the teachers' skills and competencies for choice and action.

Once we have focussed our view, a major question arises: Which are the relevant capacities and capabilities? One result of our model formulation is a preliminary answer to this question.

The model has roughly grouped teacher capabilities in four major categories: planning, inducing, implementation, and communication. The logic of the classification revolves around the roles and functions of skills in the teaching-learning process.

Planning involves forming detailed specifications and guidelines for classroom activities. Teachers vary in their skill at fashioning plans, by which we mean that these plans, if implemented, will differ in their effectiveness for achieving specified goals. A distinction between planning and other categories of teacher competency is that planning involves choice. And teacher choice is a basic but neglected aspect of research on teaching. Teachers vary in their skills for making choices as well as in carrying out specific plans or programs. Consequently, it is important to account these capacities for choice in characterizing teacher capabilities.

Implementation implies conformity between plan and actuality. Capacities to actualize planned components, configurations, and contents or achieve planned durations are not equal. Inducing capabilities foster task involvement and active learning. Teachers are dissimilar in their skills at motivating pupils as well as in other talents which impel pupils to learning. Skills of communication facilitate the learning of involved and attentive pupils. Here, diversity of teacher background and education has substantial consequences.

These four skill categories should not be taken too rigidly. They serve merely to broadly segment or regionalize the map of teacher competencies, the precise borders being of little significance.

Once a rough preliminary map of the skills and competencies of teachers which underly pupil acquisitions has been constructed, there are three important research tasks:

(1) assessment of the potential importance of each skill region;

(2) clarification, within each area, of the specific skills and their singular causal roles in the overall teaching-learning process; and

(3) detailed assessment and characterization of the causal weight of each solitary capability as it impacts on the junctures of the model, ultimately affecting pupil acquisitions.

The accomplishment of each or any of these charges will enhance our capacities to assess and select teachers and increase the adequacy of our attempts at revision and evaluation of teacher education curricula.

The first of these research priorities can be most profitably addressed by means of a time allocation study. Until we know the ranges of actual allotments to the diversity of learning settings over days, weeks, and months, we will not have any imagining of the multiformities of teacher plans or the varieties of their implementations. And until we trace the implications of teachers' uses of their own time to individual pupils, focussing on inconstancies, their correlates and causes, as well as on average allotments and their resemblance or the lack thereof to explicit curricular policies, we will not be able to fully evaluate the importance of planning and implementation for pupil achievement.

These judgements of salience are uniquely possible with time allotment data. We can validly assess the educational effects of a modification <u>in Praxis</u> soley when other relevant attributes of the situation do not concomitantly vary. And it is obvious that when neither learning rate nor the portion of active learning time fluctuate, acquisition is directly proportional to allocated time. Recalling the extreme diversity in subject matter allotments,

historic and contemporary, to which we referred earlier, it is apparent that the impacts of planning on achievement are potentially extreme.

When we wish to compare the importance of planning and implementation -- and consequently the importance of the skills which control them -- to that of inducing active learning or communication, we must obtain more subtle data. If a time allotment study also includes assessments of active learning times for individual pupils, it becomes possible to trace the potential effects of altering the durations of such times through to pupil achievement, since the time metric captures these effects on achievement when learning rates are constant. However, we need additionally to incorporate measurements of the content covered and match these to achievement evaluations, if we wish to expand our comparisons to the assessment of the importance of communication skills. Such a comprehensive study would then yield information about the absolute and relative worth of each area, permitting something not now possible: a productive critique of current teacher education curricula and teacher selection devices.

Such a comprehensive study, if implemented on a broadly representative sample, would yield information vital for other policy areas as well. For example, the extant variations in and the varieties of elementary curricula within states or even within districts could be appraised or the extent of inequality of opportunity in the guise of differential time allocations might be assessed among individual pupils. Thus, these data would be valuable far beyond their primary use.

The second research priority needs several distinct and staged programs of study rather than a single integrated one. Study of the planning process and an attempt at the delineation of planning skills would reward even a minute resource allocation. There is almost nothing known about teacher planning of any broader scope than that underlying single lessons. A small number of teacher interviews matched with some interpreted plans for days, weeks, months, and school years would greatly elucidate the differing roles of curriculum guidelines, textbooks, and teachers in the determination of kinds and amounts of instructions received by pupils. A more refined and programmatic effort would yield much greater benefits, especially for teacher education and teacher selection.

Coordinated with the more limited investigation of actual teacher plans, a pilot study of the resemblance between planned and actual teaching would greatly augment our understanding of the kinds of discrepancies that occur and help us portray teachers in ways which relate to these. Although we are presently far from it, ultimately we wish to formulate comprehensive causal systems for both planning and implementation.

A third program of study would attempt to select and position the several factors determining individual disparities in active learning time within a causal pattern. Those teacher capacities we have labeled inducing would play a substantial part in such a schema. In this skill area, a larger amount of prior study and research is relevant than with planning and implementation. There have been multiple investigations of active learning time, pupils' task engagement, motivation, motivating teacher behaviors, and of

those aspects of classroom management we have termed monitoring. Formulation of a fruitful causal framework should not be as difficult in this area of competency.

Finally, teacher communication capabilities and pupil learning efficiency need integration into a comprehensive causal skeleton . A vast plurality of research on teaching has magnified the workings of teacher communication behaviors and skills in relation to those of pupils and their achievements. Much of this work has besides incorporated the key variables of pupils' prior achievements and aptitudes, although most studies have neglected to account and match curricular coverage with the achievements assessed -- a mandatory task. Here perhaps, even a limited attempt to integrate prior work into a causal schema, explicitly formulated to be of relevance to teacher education and selection, would reward the effort expended and produce insights supportive of recommendations and decisions.

The third priority task is an integrative one. Knowledge concerning the relative values of the several groupings of teacher skills -- derived from the model and time allocation and achievement data -- together with the clarity and validity of the definitions and causal positions of the particular variables within these groupings, will determine the total salience of each specific teacher competency. Once even limited data are available on both: time allocations and causal structures, we can give a preliminary assessment of the the worth of each skill in the facitation of pupil learning.

Our earlier attempt at harvesting the vast field of research on teaching brought paltry yield of corn and ample weeds. As sources of the blight we identified oversimplification of the teaching-learning process, isolation of theory and Praxis, methodological inflexibilities, and political blindness. We tried to cultivate the ground and hope that our model will improve future crops. Our groundwork allows the nurturance and ripening of diverse seeds. For now, we will only consider the model's implications for teacher education, teacher evaluation and selection. These issues are pressing, especially since the twin spectors of "competency-based teacher education" and "performance tests of teaching" constantly haunt the hallways of teacher preparation castles.

What is a "competency-based" curriculum for teacher education? What are mandatory and what are desirable capacities of teachers? Which should be prerequisites for beginning student teachers? Which can be developed in teacher education programs? Do the current teacher education curricula address the vital issues of planning and implementation, or the inducing of pupil effort and active learning, as well as communication proficiencies, preparation and actualization of single lessons, and subject matter knowledge?

We believe that our model allows considerable augmentation of the scarce knowledge on these issues. It allows evaluation of teacher education curricula with respect to their extensiveness of coverage of imperative teacher skills, and the weight they are given to boot.

The complex of "performance tests of teaching" is another burning problem. So far, it has not been attacked promisingly. The assessment of teacher skills via mini-lessons can not grasp the essentials: broad-range inter-lesson plans, material selection, their implementations, group formation, cross-group monitoring, teacher tutoring, transitions among learning settings,.... Definitely, our model sheds light on the issues we consider indispensable in teacher evaluation.

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Table 1. Mean Subject Area Time Allocations (3rd Grade; 1926)*

	Minutes per Day
Reading	70.4
Language	62.8
Social Studies & Science	31.8
Arithmetic	39.2
General	7.4
Arts	33.4
Non-Academic	24.0
Physical Education & Recess	38.0
Total	307.0 = 5 Hours and 7 Minutes

* Adapted from Mann (1928) Tables 13B-26B, pp. 68-120 and Tables 54B-60B, pp. 181-193.

Table 2. Teacher Buehler's Grouping and Individualization Strategy

Teacher Time (Hours)	Instructional Setting	Pupil Time (Hours)				
		Total Class	Subgroup	Seat-Work (Int.Add.)	Other Seat-Work	Total
1½	Total Class					
½	Upper Third	1½	½	0	1	3
½	Middle Third	1½	½	½	½	3
½	Lower Third	1½	½	1	0	3
Total 3						

Table 3. Teacher Ewald's Grouping and Individualization Strategy

Teacher Time (Hours)	Instructional Setting	Pupil Time (Hours)				
		Total Class	Subgroup	Seat-Work (Int.Add.)	Other Seat-Work	Total
0	Total Class					
½	Upper Third	0	½	1	1½	3
1	Middle Third	0	1	1½	½	3
1½	Lower Third	0	1½	1½	0	3
Total 3						

Table 4. Teacher Oates' Grouping and Individualization Strategy

Teacher Time (Hours)	Instructional Setting	Pupil Time (Hours)				
		Total Class	Subgroup	Seat-Work (Int.Add.)	Other Seat-Work	Total
1½	Total Class					
0	Upper Third	1½	0	½	1	3
½	Middle Third	1½	½	1	0	3
1	Lower Third	1½	1	½	0	3
Total 3						

Table 5. Assumed Increments in Achievement Units for Integer Addition per Hours of Instruction

Achievement Group	Grouping Setting		
	Total Class	Subgroup	Seat-Work (Int.Add.)
Upper Third	1	2	2
Middle Third	1	1½	1
Lower Third	½	1	1

Table 6. Grouping Effects on Achievement

Teacher	Achievement Group			Average Gain
	Upper Third	Middle Third	Lower Third	
Teacher Buehler	2½	2 3/4	2¼	2½
Teacher Ewald	3	3	3	3
Teacher Oates	2½	3¼	2 2/3	2 2/3

Table 7. Time Allocations to Learning Settings in Mrs. Carr's Third Grade Class

Pupil Academic Pursuits

Curricular Area	Whole Class Pursuits	Teacher-Supervised Subgroup Pursuits	Unsupervised Individual Pursuits	Sub-total (min.)	% Aca-demic	% All
Reading		41		41	15.2	10.2
Language	58			58	21.5	14.5
Arithmetic		27		27	10.0	6.7
Music and Art	42			42	15.6	10.5
Unknown Academic	9		93	102	37.8	25.4
Subtotal (minutes)	109	68	93	270		
% of Academic Pursuits	40.4	25.2	34.4		100.0	
% of All Pursuits	27.2	17.0	23.2			67.3

All Pupil Pursuits

	Academic	Opening	Milk	Lunch &Recess	Transitions	Total
Minutes	270	5	6	89	31	401
%	67.3	1.2	1.5	22.2	7.7	100.0

Academic Teacher Activities (Excluding Transitions)

	Whole Class	Subgroup	Total
Minutes	109	153	262
%	41.6	58.4	100.0

Figure 1. Gross Determinants of Pupil Achievement

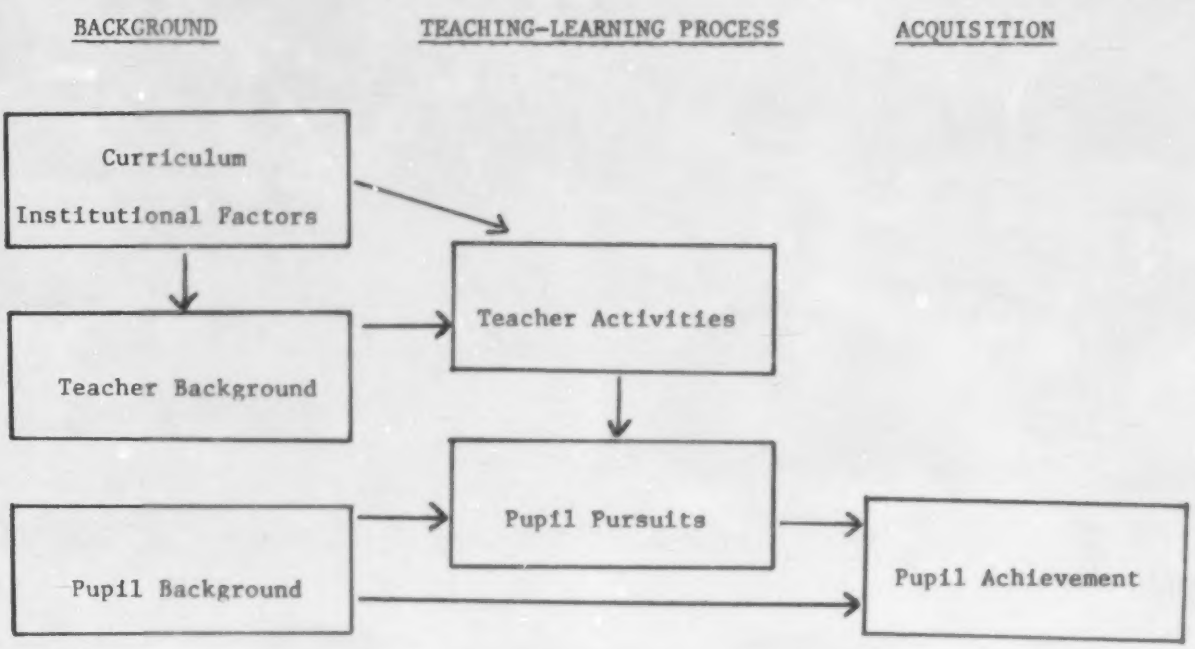


Figure 2. Sifting and Matching Pupil Pursuits to Achievement

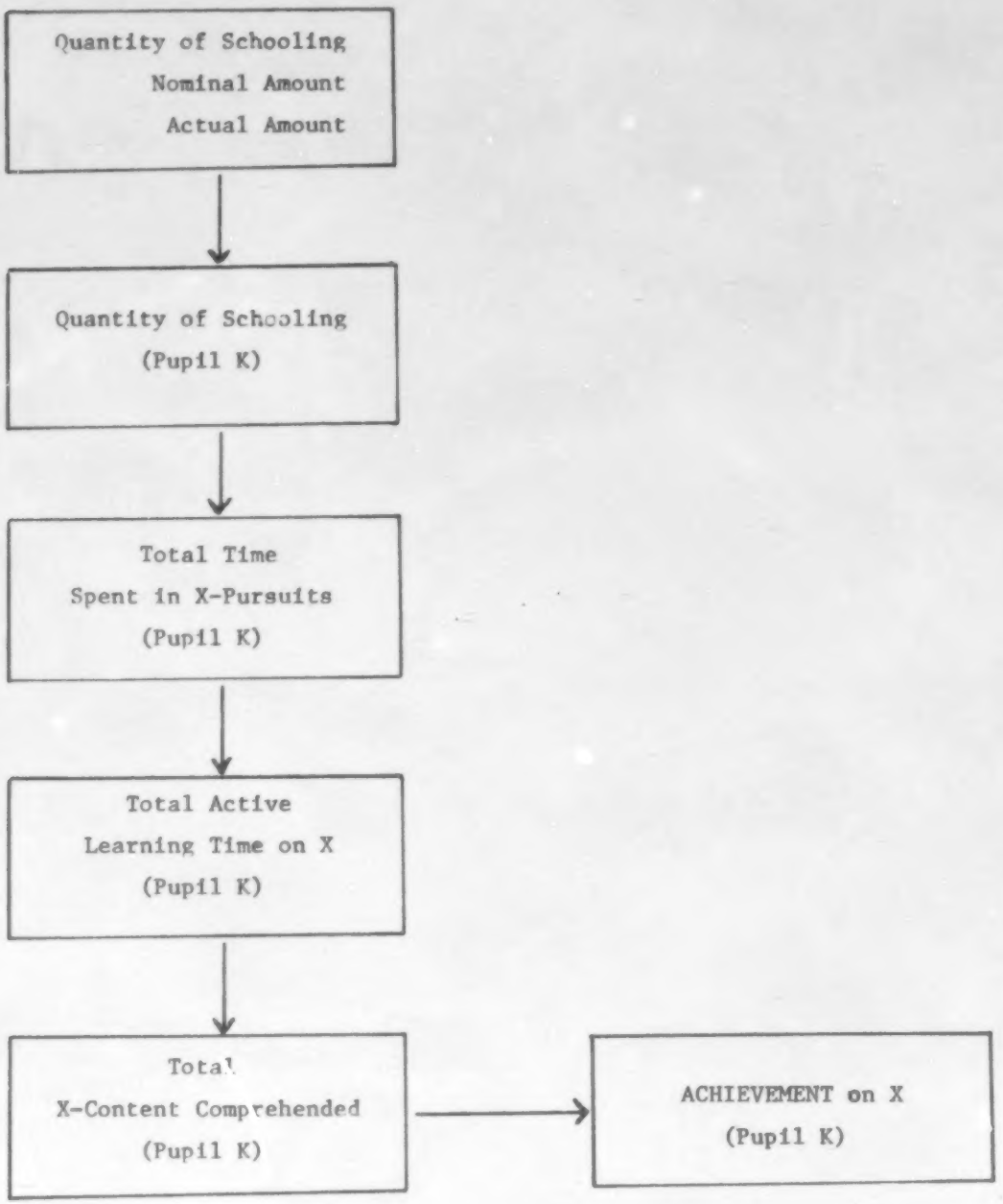


Figure 3. Unfolding the Teaching-Learning Process

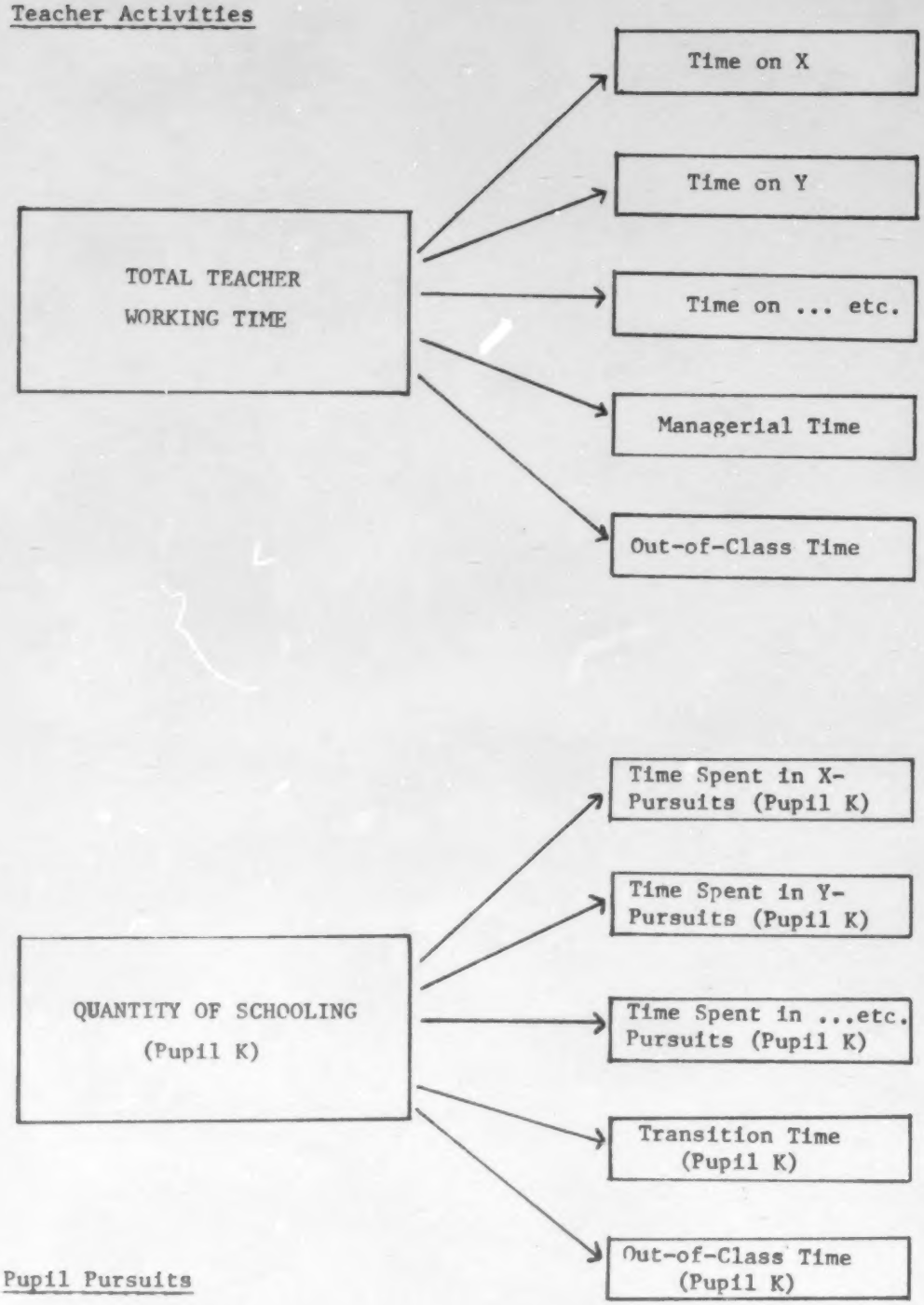


Figure 4. Unfolding of Time Allocations to Learning Settings

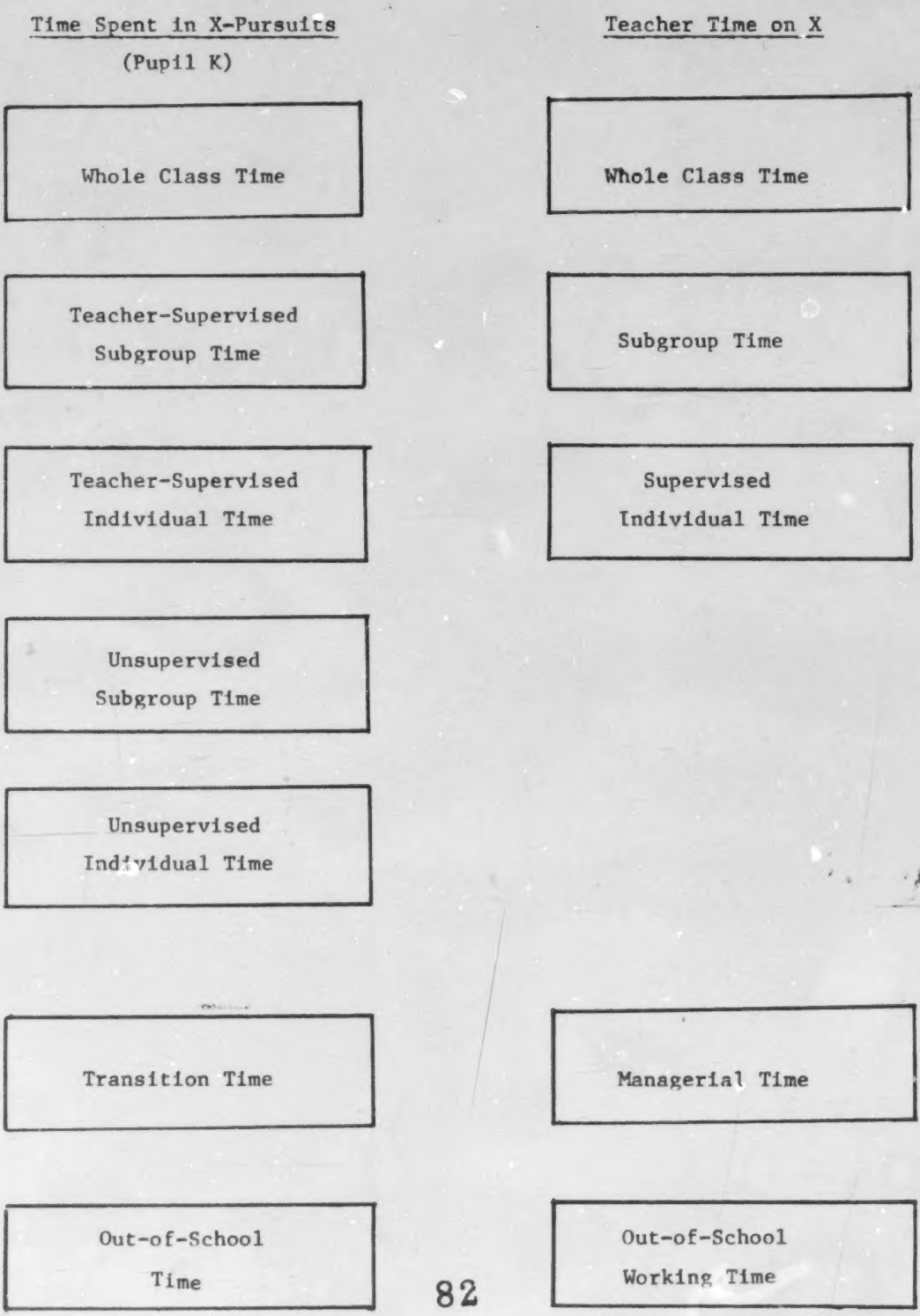


Figure 5. A Pupil's Classroom Learning Settings

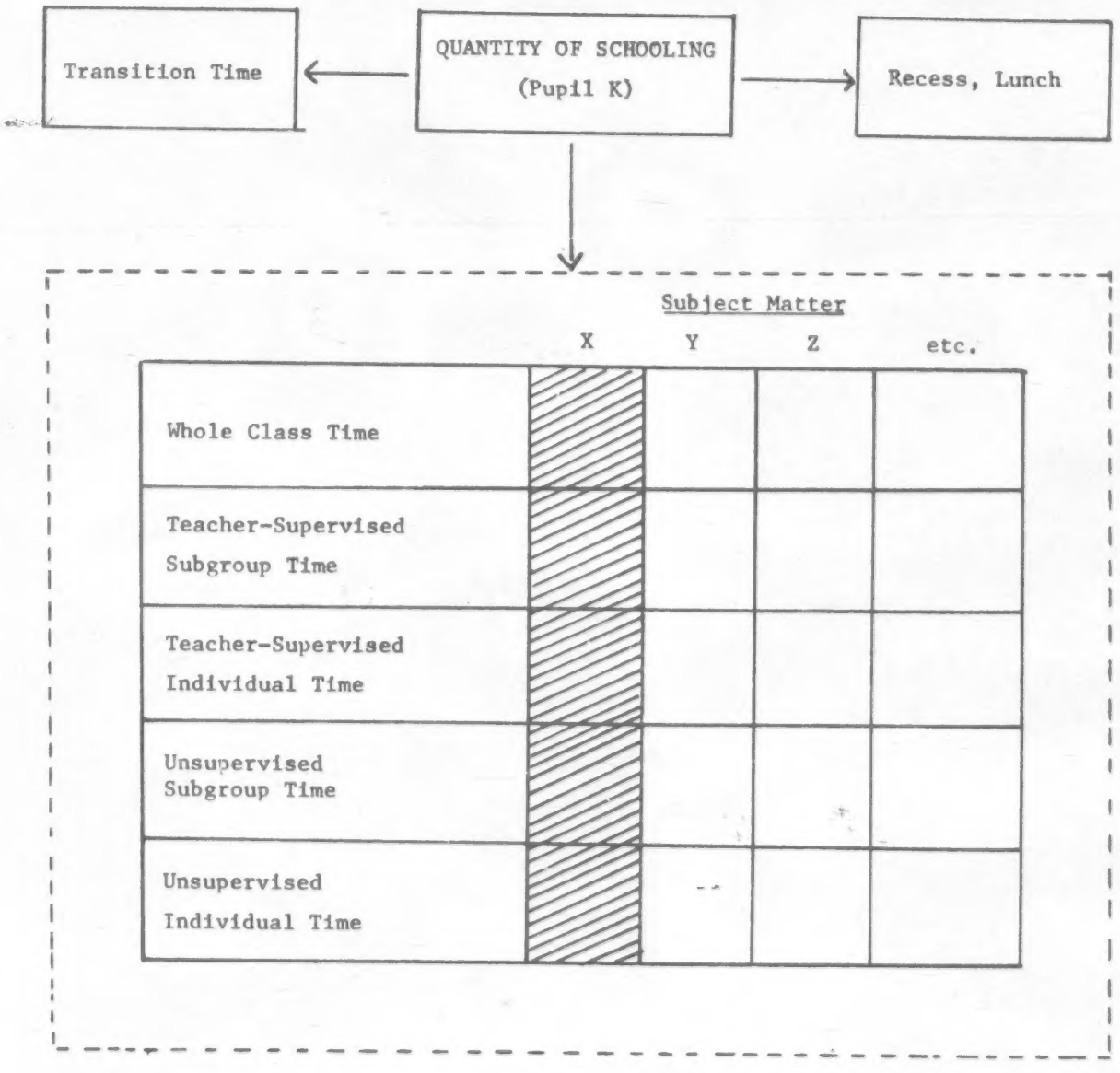


Figure 6. Categories for Pupils' Inclass Time Accounts

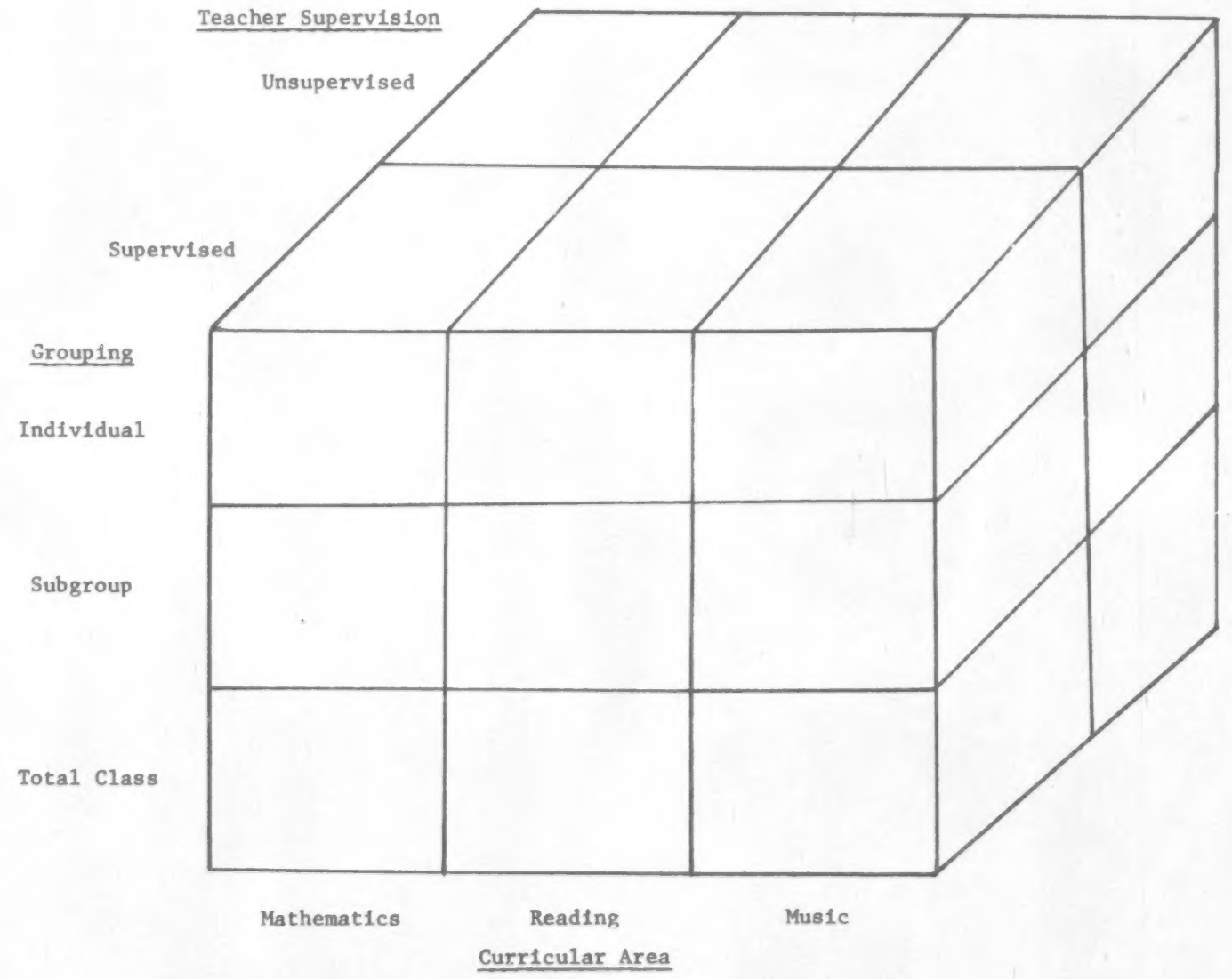
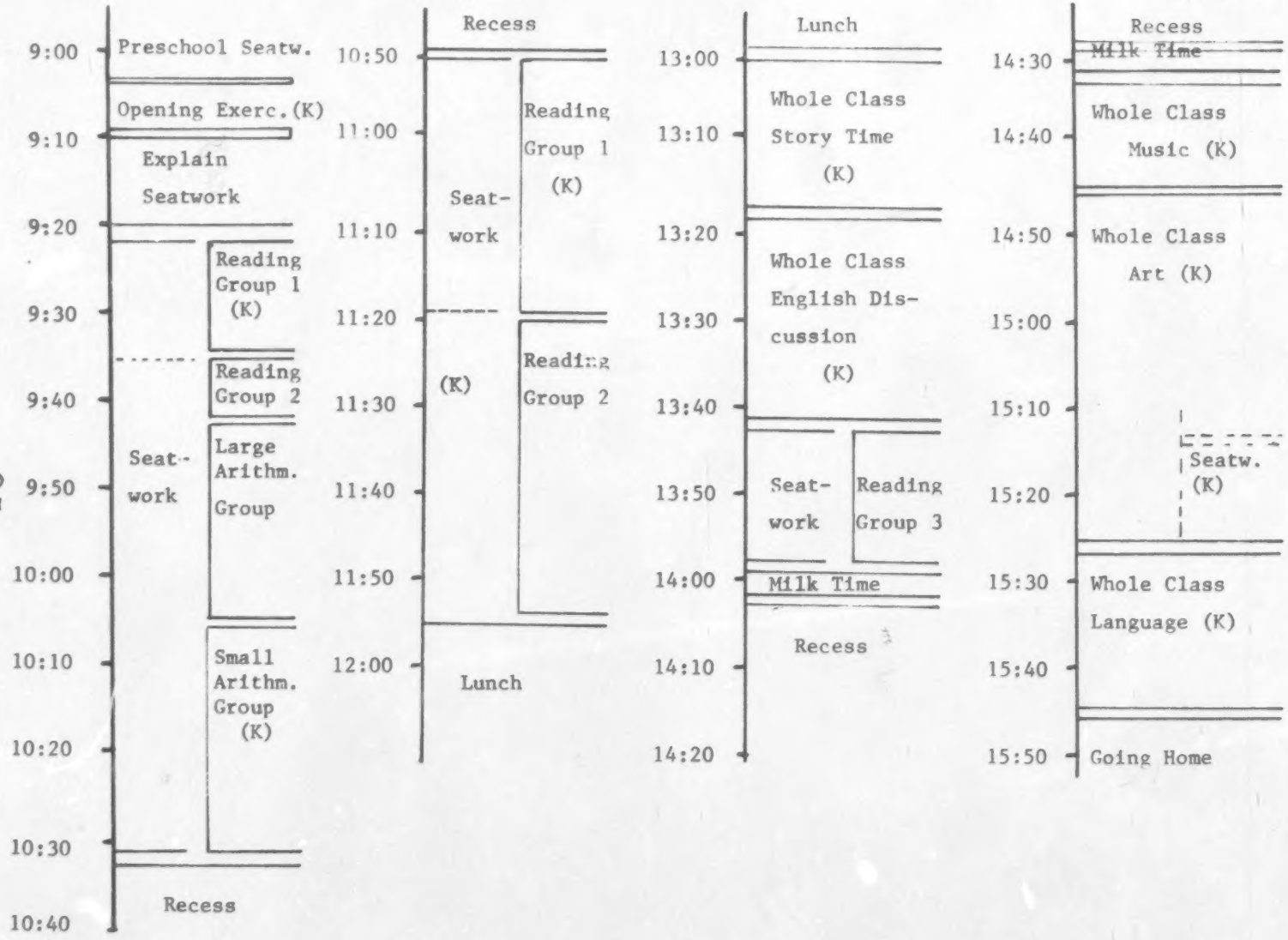


Figure 7. A Day in Mrs. Carr's Third Grade Class*



* Adapted from Gump (1967, Appendix B).

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